

## REICH-MOORE ANALYSIS OF THE IODINE-127 AND IODINE-129 RESOLVED RESONANCE RANGE

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The surge of interest for the transmutation of nuclear waste has triggered a significant demand for improved neutron cross-section data for minor actinides and long-lived fission products. With 400 kg of  $^{129}\text{I}$  produced yearly in the reactors of the EU countries and a very long  $\beta$ - half-life of 1.57<sup>7</sup> years, iodine requires disposal strategies that will isolate this isotope from the environment for long periods of time. Therefore,  $^{129}\text{I}$  is potentially a key long-lived fission product for transmutation applications, since  $^{129}\text{I}$  transmutes in  $^{130}\text{I}$  after a single neutron capture and decays to the noble gas  $^{130}\text{Xe}$  with a 12.36 h half-life.

Very little experimental work have been performed on iodine-129 neutron cross sections because of sample procurement and handling problems. The recommended resonance parameters available in the European (JEFF3.0) and Japanese (JENDL3.3) neutron libraries were generated from the capture resonance area given by R.L. Macklin. The JEFF3.0 and JENDL3.3 databases contain parameters for 126 resonances up to 3 keV. In each evaluation, the resonances are assumed to be s-waves. New accurate iodine-129 capture cross section data in the Resolved Resonance Range would help to reduce uncertainties in waste management concepts.

For that purpose, Time-Of-Flight measurements covering the [0.5 eV-100 keV] energy range have been carried out at the 150 MeV pulsed neutron source GELINA of the Institute for Reference Materials and Measurements (IRMM, Geel, Belgium). Two types of experiments have been performed, namely capture and transmission experiments. They are respectively related to the neutron capture and total cross sections. Since the  $\text{PbI}_2$  samples used in this work contain natural and radioactive iodine, extensive measurements of  $^{127}\text{I}$  have been carried out under the same experimental conditions as for the  $^{129}\text{I}$ . The data reduction process was performed with the Analysis of Geel Spectra system (AGS), and the resonance parameters were extracted with the SAMMY and REFIT shape analysis codes. The Resolved Resonance Range has been analysed in terms of Reich-Moore parameters up to 10 keV: 719 and 400 resonances have been identified respectively for  $^{127}\text{I}$  and  $^{129}\text{I}$ . Average parameters have been determined from the present set of resolved resonance parameters with the help of the ESTIMA code. The latter relies on Bayes' Theorem to provide a confident s-wave sample. It uses also the Porter-Thomas integral distribution method to determine accurate s-wave average spacing and neutron strength function by accounting for missing levels. In a last step, the present iodine-127 and iodine-129 resonance parameters have been converted into ENDF-6 format for the future release of the European neutron library JEFF3.1.